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ABSTRACT

The prescriptive model is viewed as having its roots in both replica and examplar thinking. It might be viewed as a model in which guides are set down in advance which direct what follows. Four essential strategies of this model, which are clarified by illustrations, are to select the objective, to define the objective, to use the defined objective to prescribe materials and procedures for instruction or development, and to use the defined objective to prescribe evaluation. Assumptions surrounding the prescriptive model include: (1) Defining objectives in advance will effectively prescribe development and evaluation procedures. (2) High quality definitions of objectives can be obtained quite independent of the development or evaluation of those objectives. (3) People tend to be both consistent and final in selecting objectives, in deciding on their relative worth, and in defining them. (4) Objectives ought to be defined as specifically as possible if they are to be maximally prescriptive. (5) Defined objectives which are mostly measurable are preferred to those which are mostly nonmeasurable. (6) Measurement should be mostly limited to those objectives which have been defined in advance. Suggestions are made for a more realistic improvement of the prescriptive model by replacing it with a suggestive model. (Author/BJG)

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A Prescriptive Model of Development or Evaluation:

Some Needed Maturity

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The basic purpose of this paper will be to suggest a more realistic and hopefully more mature approach in using a "prescriptive" model of product development and evaluation. First, a prescriptive model will be described and illustrated. Second, the prescriptive nature of several development and evaluation models will be identified. Third, several assumptions which surround the use of a prescriptive model will be unearthed and examined. Finally, suggestions will be made for improving the use of a prescriptive model.

Background

Understandably, a "model" can be and is defined in a variety of contexts. Likewise, evaluation and development models themselves can be classified in a variety of ways. The defining and classifying in this paper will be solely for the purpose of improving the utility of a prescriptive model rather than for the purpose of introducing a novel classification scheme.

Chapanis (1961) provides us with at least one way of thinking about models: "Scientific or engineering models are representations, or likenesses, of certain aspects of complex events, structures, or objects which in some way resemble the thing being modeled." For Chapanis, models are either replica

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or symbolic. A replica model looks like the object or phenomenon that is represented. (A globe is roughly a replica model of the earth, although it does incorporate symbolic features--the little circles representing cities for instance.) In this way of thinking, a model is generated primarily from observing phenomena in the real world, and its function is to describe as closely as possible what does in fact exist.

But there are other ways to think about a "model". It is possible to generate a model quite independent of the real world. One might generate a model for the purpose of describing what ought to exist, or what ought to take place. This could be called an exemplar model (cf. Black, 1973). Here the phenomena would not be in the form of physical characteristics of the real world but rather they might be a set of strategies or procedures that ought to be imitated. Rather than a globe which replicates the earth, one might generate a model of child-rearing practices for optimal development of the child.

For our discussion here, a model will carry the meaning of either of these conceptions and, more realistically, a combination of both. A prescriptive model will have its roots in both replica and exemplar thinking. So, for the most part, will the other models to be described. The assumptions and suggestions to be considered later will be appropriate to either conception of a model.

Evaluation and development models can be categorized along a variety of dimensions. Worthen and Sanders (1973) have provided a helpful classification of evaluation models into Judgemental Strategies, Decision-Management Strategies, and Decision-Objective Strategies. Our purpose here is not that of

providing a taxonomy of models--or of appraising existing ones. Rather, it is to identify those strategies existing within models which make them "prescriptive" models. More precisely, we will define a "prescriptive" model by a set of basic strategies. These same strategies will then be identified, in one form or another, in several extant models of development and evaluation, thus allowing them to be called "prescriptive" models (in addition to whatever else they are called). Then, the assumptions and suggestions surrounding a prescriptive model should be applicable to those particular models.

Description of the Model

The term prescriptive generally means to set down as a rule or guide to direct that which is to follow. A written instruction by a physician for the preparation and administration of a medicine is a familiar example of prescription. Moving easily from this vernacular, a prescriptive model would be one in which guides are set down in advance and they then direct what follows. More specifically, the strategies consist of deciding in advance what the final product or outcome ought to look like and then using this picture as a guide to suggest methods for developing and measuring it. The underlying philosophy is deceptively simple: Define in advance and then use this definition to prescribe. We preorder (a "preordinate" model as it were) to build in prescriptive power. To use a simple but accurate example: We would first define a student objective then use it to direct the selection of materials and teaching strategies as well as methods and content of evaluation.

The following are proposed as essential strategies of a prescriptive model. Additionally, it is proposed that strategies 1 and 2 occur in the order presented.

Strategy 1: Selecting the Objective

The term objective (or product) will carry the widest possible meaning. It can be some desired behavior on the part of the student, a curriculum module in mathematics, an altered attitude on the part of the teacher, an artistic creation of a second grader, a functional team teaching arrangement, more effective communication among administrators, or about any other desired outcome.

Who is responsible for selecting the objective? More often than not, it seems to emerge onto the scene as a result of a variety of factors such as school philosophy, assessed needs, school board recommendations, administrator commitment, teacher interest, and/or parent pressure.

Strategy 2: Defining the Objective

Once the objective has been agreed upon it must be defined as completely as possible. This amounts to describing its critical properties or attributes in such a way as to bring the objective into existence. The objective in its defined form allows us to differentiate it from other similar as well as unrelated objectives and, importantly, to determine when the objective has in fact been attained or produced. It is equally important to note that an objective may be defined differently in different contexts. That is, it may possess different critical properties depending upon its context. The objective "independent learning" will have a different set of critical properties for third graders than for graduate

students studying abroad. Likewise, the agency working with the objective may have developed its own definition or set of critical properties. The superintendent's office may define "new math modules" quite differently than the classroom teacher who has developed and is currently using them.

Not until the objective has been defined does it become prescriptive in nature. More prcisely, the greater the definition of the objective the more prescriptive it becomes. For example, suppose the objective (or product) "independent learning." There is little about this outcome that suggests any developmental procedures or evaluation activities. But suppose we started to define this objective. In doing so we emerge with a variety of critical properties one of which is "Finding the answers to questions without having to turn to human sources." Now we can begin to see some prescriptive power. Are there some implications about materials to use in the process of development? Are any evaluation procedures hinted at? Yes, with some thought. Obviously some definitions of the objective will carry more prescriptive power than others; but the important point is that a defined objective begins to carry prescriptive power.

Strategy 3: Using the defined objective to prescribe materials and procedures for instruction or development

The developer or teacher carries out this strategy by asking a series of questions then attempting to answer them. In effect he or she asks: "What does this product suggest in the way of needed materials? Developmental strategies? Sequencing?" Or, "What does this defined objective suggest in the

way of prerequisite curriculum materials? Instructional experiences? In what sequence?"

In carrying out this strategy we observe an emerging principle which was alluded to earlier: The greater the specificity and observableness of the defined objective the more clearly it suggests materials and development procedures. Suppose for example the following product or objective: "The development of an individualized reading approach." Suppose that in the process of defining this objective a group decided upon, among others, these two critical properties: (1) "This will be an approach in which the teacher sits down with each child and helps him or her decide which books in the Learning Resource Center are of interest to read," and (2) "This will be an approach in which the student's needs are individualized." Critical property number 1 is more specific and more observable than critical property number 2 and, as a result, it more clearly suggests some materials and developmental procedures.

Strategy 4: Using the defined objective to prescribe evaluation

Defined objectives have a dual prescriptive nature. As already indicated, they prescribe materials and procedures for development; but they also perform the same function relative to evaluation. The evaluator--whoever he or she may be--might ask: "How can I measure the development of this product?" Or, "How can I measure the degree of attainment of the defined objectives?" Here, these questions act as a prompter for teasing out the appropriate types of measuring instruments. Referring back to the above example of critical properties, we see that the same principle holds in the strategy of planning

evaluation: The greater the specificity and observableness of the defined objective the more clearly it suggests evaluation instruments and procedures. The first critical property is easily more prescriptive than the second. It implies that the teacher might use a self report or interest survey to determine each child's interest; it also implies that she uses some sort of checklist to record books selected by each child and whether or not these generally coincide with his interests.

In introducing the prescriptive model, only the essential strategies have been included and these were described as simply as possible. This was done for the purpose of facilitating identification of the prescriptive model among existing models. Before going into several illustrations, there needs to be a statement or two about the sequence of the strategies. One would probably reason that in order for the model to indeed be prescriptive strategies 1 and 2--selecting and defining the objective--must in fact occur first. Herein lies the essence of its prescriptiveness. Or, this order is by definition what makes the model prescriptive. After these two, the argument would run, the order may not be all that critical. Whether the development is planned first or the evaluation planned first may not make that much difference. The important point is that they are both prescribed from the defined objectives. One might suggest that development occurs first, then evaluation if some order is to be indicated.

Three Illustrations of a Prescriptive Model

The prescriptive model will now further be identified through three illustrations which differ widely. In the first, the product or objective will be some desired outcome on the part of students in a classroom. In the second, the product or objective will be the establishment of a certain type of classroom atmosphere. The third will be the production of a particular instructional package. These illustrations are introduced for two purposes. The first is to illustrate how the model might be used, and the second, to illuminate some of the unrealities of the model which will be discussed in a later section.

The Ability to Correctly Tell Time

This will be a simple and vivid illustration which will readily show the prescriptive nature of the model. The teacher, responding to the district's educational philosophy, suggestions from textbooks, practices of fellow teachers, and her own personal values, selects the following objective: "Each student will be able to function as both an independent and a cooperating member of his society." Contemplating this objective, she judges it to be rather broad and inclusive and largely undefined for teaching purposes. Thus, she generates many offspring objectives one of which is "The student will be able to correctly tell time." Quite unintentionally, she has engaged in both strategies 1 and 2.

At this stage, the teacher begins to ask herself, "What will I need to provide the students by way of materials, experiences, and instruction?" In thinking over these questions she decides to construct a large cardboard

clock with movable hands. She also reasons that since the children should have exposure to some of the types of clocks that they will actually use in telling time, a variety of such clocks will need to be introduced at a later point.

Procedurally, she decides to start out by having the students learn all the numerals and their positions on the large clock face. Then she will teach the function of both the large and small hands and their important relationships. This will include concepts of seconds, minutes, hours, twelve hours and twenty-four hours. Finally, she will have the students practice identifying various clock settings on the large cardboard clock. This will be interspersed with exercises in which the student is asked to make correct hand settings. Then, for transfer, she will have them to carry out these tasks using actual clocks. Our teacher has, in effect, completed strategy 3.

Sometime during the final stages of the practice sessions, the teacher might ask herself, "Is there a final or certifying way I can measure whether or not my students can actually tell time?" "What type of a measuring instrument would I use? How shall I go about measuring?" After some thought she decides to measure by giving the students actual time settings on real-life clocks and watches. She will call each student individually to her desk over a period of time and present him or her with five to ten clock settings. The response to each setting will be classified on a checklist as either "correct" or "incorrect" or "unable to judge". Then she will present the student with a clock and ask for a series of correct settings. Finally, she will make up

some story problems which call for a wide variety of "time telling" activities. On the basis of these responses made over a period of time the teacher will draw her conclusions about the attainment of the objective. Here, then, she has completed strategy 4.

The Establishment of an Open Concept Classroom

Suppose that persons in a certain school district, acting upon the results of a needs assessment survey, decide to develop an "open concept classroom" as part of an individualizing effort at the elementary level. In this setting, the needs assessment survey is generated as a result of identified discrepencies among the school's basic philosophy, teacher discontent, and the reactions of school board members. Specifically, while the school's basic philosophy calls for the development of a "free and independent decision maker," both the teachers and the school board feel that neither the physical structures nor teaching practices foster the development of such a person. Thus, a needs assessment is conducted and the results are confirming. Based upon the report a consortium selects as an intermediate objective, "The establishment of an open concept classroom within the elementary schools in the district." In a rather formal way, this completes strategy 1.

Moving towards strategy 2, members of the consortium begin to ask, "How can we further define this objective? What are the characteristics of an open concept classroom?" After considerable deliberation, the group comes up with the following definition of their objective:

An "open concept classroom" is one in which

a. Each student feels free

b. Each student can select and study any topic of his or her own choice

c. The amount of time the teacher addresses the class as a unit is less than five percent

d. Visitors and other nonclass members can come and go without disrupting what individuals within the class are doing

e. There are not permanent partitions within the room

Upon further analysis, the group decides that the first critical property, "Each student feels free" is not sufficiently defined. Their second effort with this property turns up the following: "There is no restriction on physical movement or verbalizations of any student within the classroom. Likewise, there is no restriction on who enters or leaves the room" This further defining seems to increase the prescriptive power of the objective.

Moving into Strategy 3 the group might begin to ask, "What type of rearrangement of the physical facilities is suggested by this objective? How ought present teacher-student relationships to be modified? What are some implications for material selection centers? How should classroom periods be modified?"

In attempting to provide answers for some of these questions the group comes up with recommendations such as: Construct a room in which all partitions or screens are moveable; develop a wide variety of resources

which can be used by individual students and which will not compete with each other; help teachers develop instructional experiences so they will not be required to meet with the class as an entire unit more than five percent of the time; encourage outsiders to spend time in the room and make adjustments to reduce their interference. This sort of activity basically completes strategy 3 although the strategy is revisited from time to time.

Strategy 4 has been going on concurrently with strategy 3 with the help of a professional evaluator earlier called into the group. Here, the members begin to ask questions like, "What are some direct and rather valid measures of this defined objective? Are any suggested to us by looking at these various critical properties?"

Suppose the group begins by focussing on the first critical property: "There is no restriction on physical movement or verbalizations of any student within the classroom. Likewise, there are no restrictions on who enters or leaves the room." They decide that an observational instrument such as a rating scale would be a valid measure of "degree of restriction." A sample of randomly selected students are unobstrusively observed over a period of time. Additionally, each student is asked to respond on paper or in interview to questions about his degree of restriction. Additionally, a tape recorder captures the verbalizations of students and, after construction a judgment scale, utterances are analyzed in terms of the degree to which they manifest restriction.

Similar kinds of procedures are followed for the development of instruments and data gathering techniques for the other defined critical properties.

The "telling time" illustration is somewhat less involved than is the "open concept" illustration. Thus, the defined objectives in the latter case are somewhat less prescriptive of development and evaluation procedures. Notwithstanding, the strategies of the descriptive model are still visible in this second illustration.

A Cardiovascular Endurance Program

In this third illustration the product or objective will be a "package" in the sense that a student manual and a management program are to be produced. Additionally, we will see here that part of the prescriptive power is unused because development largely occurs without the aid of defined objectives. This case is a very typical one. The product is selected then materials and procedures for its development are produced and then they are implemented. Sometime later, after a trial period, an evaluation is attempted. Before this can be carried out, however, the selected objectives must be recaptured and carefully defined. Then, on the basis of these defined objectives, valid measuring instruments can be developed. Here, then, is the sequence: Strategy 1, strategy 3, strategy 2, and strategy 4.

We turn now to the illustration. For the past several years, instructors in physical education have become increasingly concerned about the decline in enrollment of students in physical education courses. Concurrently, evidence at the national levels indicates an increase in sedentary living among all age levels along with a correlative increase in premature cardiovascular

problems. These trends prompt the physical education faculty to join forces in attacking the problem. They decide to develop a new course at the university level called "Fitness for Life." This course is based upon a manual designed to place each student into his own fitness program for the purpose of increasing cardiovascular endurance and, where appropriate, reducing body fat. The manual grew out of Cooper's Aerobics Program that has attracted thousands of people over the past few years. The objective or product that seems to have implicitly emerged is "The production of a fitness of life program". Here the selection of the objective or product (Strategy 1) is really an evolving rather than a deliberate activity, and occurs over a longer period of time. Nonetheless, the objective has been implicitly present and would be agreed upon by the various faculty members.

The major emphasis in this illustration appears to be on the development of the product or objective. Here is where most of the time, energy and money are expended. This means that the model is only implicitly prescriptive. The development activities are only vaguely guided by the objectives because they are implicit. Therefore, much of the potential prescriptive power is unused. Rather than asking questions like "What do the defined objectives suggest by way of materials and development procedures?" the questions are much less directive: "How shall we develop the manual? What shall it contain? In what sequence? What will be an efficient management system? What physical facilities will be needed? How shall we work out the student-teacher contact time and the establishment of student contracts?"

These questions and others lead to the development of a manual which incorporates the feelings and judgments of those participating. It is then presented to students to determine clarity and interest. Revisions are made based upon both student feedback and instructor reactions.

On the first day of class the students are shown films intended to motivate and orient them for the remainder of the semester. Then, after initial measures of cardiovascular endurance and body fat have been taken, the student meets individually with an instructor for the purpose of making personal contracts. Periodically, the student returns with his daily log for progress checks and for contract revisions. At the end of the semester, he returns for written evaluations and final endurance and body fat testing. Since each student makes a different contract, engages in different exercise programs, and completes his training at different rates, a management center is established to accommodate these varying programs and differential completions. All of these activities can be loosely described as strategy 3. But this is a watered down strategy 3 because the objectives have not been defined and are therefore only implicitly prescriptive.

The next strategy is actually a combination of strategies 2 and 4. The program is implemented for two semesters. During this time many of the weaknesses in the manual and in the management system arise and are recorded. These anecdotal data indicate that it is now time for a more systematic and thorough evaluation of the product or objective. As is often the case, an evaluator is asked to assist in this strategy. Being committed to a prescriptive model of evaluation, he prompts the group to sit down and define more carefully what the objective really was or has been so that he might more effectively design the measurement.

As it turns out, there are several objectives rather than one. First of all, there are some relating to the student. For example, "The student will be able to keep his contract;" "He will develop a positive attitude towards the course." Second, there are objectives surrounding the manual itself. For example, "Illustrations are clear;" "Language and directions are sufficient to provide complete direction for the student;" "The manual is not too long;" "the log charts are functional;" "the cost is well within the student's reach." Finally, there are objectives surrounding the management system. For example, "The ratio of instructors to students will be small enough for optimal learning;" "the films will provide proper motivation and direction;" "students will have immediate access to and feedback from the management center;" "the center will be able to ascertain reasons for dropouts from the program;" "the testing for cardiovascular endurance and body fat will be valid and have good reliability." These various objectives are sorted out and defined as completely as possible, a process which essentially constitutes strategy 2.

Having completed this strategy, the group is now ready to move into strategy 4, using the defined objectives to prescribe evaluation. Here, because of having backtracked to strategy 2, the prescriptive power of the model is available, at least as far as evaluation is concerned. "What do these defined student objectives suggest in the way of measuring instruments and procedures?" "What do these defined objectives surrounding the manual suggest by way of measuring instruments and procedures?" "What do those suggest that surround the management system?"

In answering these questions suppose the following occur: Additional measures are developed to measure endurance and body fat; the original instrument

for endurance was the Step Test and this is replaced with an actual oxygen consumption measure. The original questionnaires designed to measure student affect are modified to more fully capture responses towards various aspects of the course; charts are constructed to obtain clearer data from the management center such as the actual number of dropouts, when they dropped out, and what their reasons were; finally, instruments are designed to gather data about lingering questions the instructors feel are important: Would the student recommend the class to friends? How can the instructors motivate the students to keep up with their contracts? What additional aids would be helpful? Do the students feel they need to meet more often with the instructor? These activities are samples of those constituting strategy 4.

The three foreging illustrations are concrete examples of the prescriptive model in actual practice. Because the objectives varied in their complexity and degree of definition from case to case, the prescriptiveness of the model also varied. Yet in each case, we could clearly identify the four basic strategies, although not always in the same sequence.

Extant Examples of Prescriptive Models

Evaluation Models

The current educational scene provides many anecdotal evidences of prescriptive models in both development and evaluation settings . . . in the planning of this school's curriculum, in the evaluation of that reading program, in the establishment of this or that training program, in the school board's deliberations about more open concept schools, in the

planning of a new science course, in constructing a needs assessment survey, and in generating proposals for federal funding, to name but a few.

What are the historical roots of a prescriptive philosphy? Answering this question depends largely upon how one chooses to select from history and how broadly and deeply will be the search. At least one person and two publications have significantly influenced current thinking about and use of prescriptive models. Ralph Tyler's evaluation of the Eight Year Study in the thirties Smith and Tyler, 1942; (Tyler, 1931; 1934) was clearly an early articulation of the model. This model--or at least the prescriptive philosophy behind it--has been evident in much of his subsequent work as well (e.g. Tyler, 1942; 1958). As he identifies the steps in an evaluation program, the earmarks of a prescriptive model emerge:

(a) To establish broad goals or objectives;
(b) To classify objectives;
(c) To define objectives in behavioral terms;
(d) To find situations in which achievement of objectives can be shown;
(e) To develop or select measurement techniques;
(f) To collect student performance data; and
(g) to compare data with behaviorally stated objectives.

Referring back to the strategies of the prescriptive model, strategy 1 can be seen in steps (a) and (b); strategy 2 in step (c); strategy 4 in steps (d) and (e). Since this is basically an evaluation model, strategy 3, using defined objectives to prescribe instruction, is not relevant.

A first publication in which the writers themselves were influenced by Tyler has unquestionably provided impetus for prescriptive models:

The Taxonomy of Educational Objectives, Handbook I: Cognitive Domain, edited by Bloom et al (1956). Its contribution seems to have been in the identifying of various "levels" of cognitive behaviors which can be selected for teaching purposes. While a taxonomy of eductional objectives should not be construed as a model of evaluation, it does prompt teachers to start with objectives in the planning of instruction and evaluation. That is, a taxonomy such as this facilitates strategies 1 and 2 of the prescriptive model and thus encourages teachers to use predetermined outcomes to plan instruction and evaluation.

A second publication, unlike the Taxonomy of Educational Objectives, appeared originally under the title Preparing Objectives for Programmed Instruction (1962). This was a readable and entertaining little book written by Robert Mager. It was simple, easy to follow, and represented a "how-to-write objectives" book. Initially, however, it preceded the Zeitgeist and sputtered as a result. Several years later with the title changed to Preparing Instructional Objectives, people everywhere began to read and adopt its rather straightforward strategies for writing behavioral objectives. While this little book fell short of describing a model or of suggesting how objectives might be used to prescribe instruction and evaiuation, it did again prompt people to write out in advance their "behavioral objectives".

To be sure, others have extended the work of Tyler, Bloom et al and Mager; but these people did provide historical roots of the prescriptive model.

Turning to some of the later and more elegant models of evaluation, the strategies of a prescriptive model are not so readily identified. This is not to suggest their nonexistence. Rather, it attests to an increasing complexity of the evaluation process itself and the attempt on the part of model builders to reflect and capture this complexity. Worthen and Sanders (1973) have helpfully classified various evaluation models. Those they call Decision-objectives strategies are most easily identified as prescriptive models.

The first to consider will be Hammond's model (pp. 157-170). Basically, he identifies five steps in structuring an evaluation at the local level:

(a) Selection of that part of the program to be evaluated, typically a single subject area

(b) Defining the descriptive variables in the institutional and Instructional dimensions (such as cost, facilities, student and teacher characteristics)

(c) Stating objectives in behavioral terms

(d) Assessing the behavior described in the objectives

(e) Analyzing results to arrive at conclusions about effectiveness of program in reaching desired outcomes.

Here, also, we can see the prescriptive nature of this model. Strategy 1 in the prescriptive model is implied here in step (a) because when we select what is to be evaluated we are selecting the implicit objectives; strategy 2 is similar to steps (b) and (c) here; strategy 4 is implied by step (d). Hammond's step (e) is essentially a feedback phase. The

results are used to modify the program. This particular step can be identified in many if not most of the existing evaluation models. Since our concern in this paper is with the prescriptive nature of a model rather that its feedback function after prescription has taken place, this feedback phase has been omitted as part of the prescriptive model.

Another rather involved evaluation model is Provus' Discrepancy Model (pp. 170-207). Basically, this model is designed for the evaluation of emerging programs. The model involves three major steps:

I. Agreeing upon program standards
II. Determining whether a discrepancy exists between some aspect of the program
III. Using discrepancy information to identify the weakness of the program.

These steps are translated into specific stages of the evaluation activity:

(a) Description of the program in terms of such characteristics as: client population, staff, major terminal objectives of the program, enabling or intervening objectives, nature and sequence of learning experiences which will lead to the attainment of the enabling objectives, entry behaviors of clients, and so forth.

(b) Information is obtained to determine if there is a discrepancy between expected characteristics of the program and how it actually looks as it is implemented.

(c) Data are collected to determine whether student behavior is changing as predicted. That is, is the program achieving its enabling objectives?

(d) Here data are gathered to determine the degree to which the terminal objectives have been achieved.

This model is again prescriptive in nature. Strategies 1 and 2 of the prescriptive model are comparable to step (a) here; strategy 4 of the prescriptive model is implied by steps (b), (c) and (d) here; that is objectives prescribe data collection and these data are in turn used to determine discrepancies between defined objectives and what actually exists.

Alkin (pp. 150-155) has developed a decision-making model of evaluation which is likewise prescriptive in nature. He has identified five decision areas in which evaluation information will be useful:

(a) Systems assessment

(b) Program planning

(c) Program implementation

(d) Program improvement

(e) Program certification

Embedded in the evaluation of systems assessment (a) is the selection and definition of objectives for all clients in the school. Data are then gathered to determine the degree of discrepancy between these objectives and what actually exists. Based on the identified needs, program planning (b) and implementation (c) take place with appropriate evaluation in each area. Based upon data gathered in these areas, program improvement (d) is initiated. Implicitly, we can see strategies 1 and 2 of the prescriptive model in the evaluation of the systems assessment area (a); likewise,

strategy 3 is implied in area (b). Finally, strategy 4 is implicit in the evaluation of areas (d) and (e).

Stufflebeam (pp. 143-148) has described an evaluation design appropriate for four major types of evaluation. The design itself includes three major steps:

(a) Identify the objectives to be achieved through implementation of the design.

(b) Identify the decision situations for achieving the objective (Identify possible measuring devices appropriate for assessing the objectives.)

(c) For each identified decision situation the evaluator needs to make a choice among the alternatives (the completed design would contain a set of decisions as to how the evaluation is to be conducted and what instruments will be used).

This general description of the steps in Stufflebeam's design also reveals a prescriptive nature. Strategies 1 and 2 of the prescriptive model are embodied in steps (a) and (b) here; both strategies 3 and 4 seem to be suggested by step (b) and to a lesser extent by step (c).

What we see, then, in these examples, are various forms or a least strands of a prescriptive model. To more convincingly pin down the prescriptive strategies in each model is currently impossible because of their generalized nature and because their implementations vary so widely. Notwithstanding, we can observe that these models stress an early

definition of objectives followed by the development of measuring instruments. Implicit in this strategy is the use of objectives to prescribe that evaluation.

Development Models

Let us turn to two development models where we can observe the same prescriptive phenomenon, perhaps more vividly than in the foregoing evaluation models.

Sullivan, Baker & Schutz (1071) have listed the following components of an instructional specification:

(a) The objective

(b) The cue

(c) Mastery items

(d) Limits

(e) Entry skills

Component (a) is that of specifying the learner objective; component (b) is that of providing the learner with a rule or set of procedures which will enable him to perform the desired behavior. In component (c) mastery items are developed to provide the learner practice and to assess his performance of the objective. Component (d) is that of describing characteristics of the correct and incorrect responses of the learner. Component (e) is determining the learner's skills that must be possessed prior to instruction.

These components follow closely the strategies of the prescriptive model: Strategy 1 is implicit in component (a) here; strategy 3 is found in component (b) here; finally, strategy 4 is implied by component (c).

Popham and Baker (1971) have listed the following as the product development cycle:

(a) Formulation

(b) Instructional specifications

(c) Item tryout

(d) Product development

(e) Product tryout

(f) Product revision

(g) Operations analysis

The formulation state (a) is that period when one or more persons decide what an instructional product, already conceived to some extent, ought to accomplish and whether it is worth developing. The instructional specifications stage (b) is that period when the instructional objectives of the product are delineated. The item tryout stage (c) is that period when items are constructed and administered to measure the terminal, en-route and entry behavior of the learner. The product development stage (d) is that period when the instructional materials are prepared for the purpose of helping the learner achieve the target objectives. The product tryout stage (e) occurs when the materials are tried out extensively on a group of learners to see their effectiveness in achieving the objectives. The product revision stage (f) is that period when the materials are revised based upon the data gathered from the tryout stage. Finally, the operations analysis stage (g) is that phase when the staff appraises the adequacy of the procedures which were employed in preparing the product.

This model, too, is basically prescriptive. Strategy 1 in the prescriptive model is identical to stage (a) here; strategy 2 is equivalent to stage (b) here; strategy 3 is the same as stage (d) here; and strategy 4 is encompassed in stages (c) and (e) in this model.

As with the evaluation models, we see the same prescriptive nature in these development models: Selecting and defining of the objectives as an initial activity; then their use in prescribing or guiding subsequent development and evaluation. On the basis of this rather lengthy discussion and set of comparisons, it is not unreasonable to conclude that many of the current development and evaluation models are basically prescriptive in nature or have at least been born of a prescriptive parent. Further, much development and evaluation activity that actually takes place is identifiably prescriptive in nature.

Assumptions Surrounding a Prescriptive Model

In order to think more exhaustively about the potential strengths and weaknesses of a prescriptive model, it might be helpful to unearth some of the assumptions that can be and often are made by persons as they use the model:

1) Defining objectives in advance will effectively prescribe development and evaluation procedures.

2) High quality definitions of objectives can be obtained quite independent of the development or evaluation of those objectives.

3) People tend to be both consistent and final in selecting objectives, in deciding upon their relative worth, and in defining them.

4) Objectives ought to be defined as specifically as possible if they are to be maximally prescriptive.

5) Defined objectives which are mostly measurable are preferred to those which are mostly nonmeasurable.

6) In developing measuring instruments for objectives, every attempt should be made to obtain a one-to-one correspondence between a given objective and its measuring instrument.

7) Measurement should be mostly limited to those objectives which have been defined in advance.

Discussion and Suggestions

We are now ready to identify the major concern of this paper: If a person--using a prescriptive model--operates from the above assumptions, then the model will become increasingly unrealistic and less viable as the objectives or products become more complex. Stated another way, as the products or objectives to be developed or evaluated become increasingly involved the above assumptions must undergo modification.

It is seldom the case that an evaluator or product developer will sit down and identify the assumptions upon which he operates. Therefore, how would one know whether or not he is making these assumptions in using a prescriptive model? Answering this question is not an easy task. Perhaps our most certain approach is to observe the way he acts as he evaluates or develops a product and

from this infer the assumptions upon which he must be operating. Thus, if he consistently insists on defining the objectives at the outset of every evaluation project, we infer that he is operating on assumption 1 (defining objectives in advance will effectively prescribe development and evaluation procedures).

The above assumptions, in effect, summarize some of the potential weaknesses of the model. Or, stated positively, they represent areas in which the prescriptive model can be enriched.

Before turning to each assumption, several statements should be made about the overall weakness of the model. If the above assumptions are made, then the prescriptive model is most effective with very simple products or objectives. But as the objectives or products become increasingly complex and involved, the model (because of its assumptions) is stretched to the point where it can no longer accommodate the demands of the objectives' or products' development or evaluation. In more complex settings the strategies of the model appear simplistic, overly rigid, and wanting in effectiveness. Let us illustrate this point. Suppose the following simple objective: "The student will be able to recite the poem 'At the Seaside.'" Here the prescriptive model is effective. What does the objective suggest by way of instructional materials and procedures? Obviously the material is the poem 'At the Seaside.' Next, since the student must be able to recite the poem, he is presented with a spaced series of drill periods in which he slowly comes to memorize the material. Now, what does the objective suggest by way of evaluation? Here the prescription is complete. A valid instrument would be an oral question by the teacher asking the student to "Recite the poem 'At the Seaside.'" Notice there is essentially a one-to-one correspondence between the objective and the evaluation.

Indeed, the objective is the evaluation. The above assumptions can be comfortably made in using the prescriptive model on such a simple objective.

But what happens when we move--as we inevitably must--to more complex and sophisticated objectives and products? Returning to the three illustrations presented earlier we can see by examination that the model is not really prescriptive at all but only mildly suggestive. Even in the simplest illustration where the objective was, "The student will be able to correctly tell time" much of the development materials and procedures as well as evaluation were only implied by the objective. The strategy here was almost, "Given this objective it seems like it might be appropriate to use these kinds of materials and engage in these types of experiences. For the evaluation, we might do such and such." With the more complex objective, "An open concept classroom" the prescriptiveness was more uncertain, and with the "Production of a cardiovascular endurance program" it was even more diffuse. But, nonetheless, in each case, the predefined objectives or products were suggestive. The point is that we ought not to imbue the model with more functionality than it in fact possesses, particularly when working with more complex objectives or products. How functional it will be depends in large part upon how strictly one adheres to the above assumptions. Unless we use the model more maturely we can easily end up with undernourished, rigid and unresponsive evaluations. In general, this means viewing the model as suggestive rather than prescriptive and in loosening up on the assumptions. Stated even more imprecisely,

we need to worry more about building strong products and conducting deep and thorough evaluations . . . and worry less about trying to fit a single set of strategies onto every job.

Let us now examine the individual assumptions and, when possible, suggest a modified posture toward them. Assumption 1 is critical and upon it rests the entire model. There are two problems with this assumption. First, not all desirable objectives can be forseen in advance. Nor should this be a necessary imposition placed upon a developer or evaluator. It is perfectly legitimate--and much of the time desirable--to anticipate that there will arise desirable objectives which were at the outset unknown or overlooked. The reluctance on the part of developers, evaluators, school people to assume this position stems from the problem of adjustment and modification. If unforseen objectives arise then the development activities will need to accommodate them; so will the evaluation. These constantly adjusting and accommodating activities are expensive in time, money and energy. The natural tendency is to adopt a "tighter" system, even in light of a basic commitment to formative development and formative evaluation.

The second problem with Assumption 1 has already been discussed. In practice, predefined objectives are seldom prescriptive. More realistically, one simply draws some <u>implications</u> for development and evaluation. Thus, the strategy of defining objectives in advance is often helpful but certainly not as prescriptively powerful as we might be led to believe.

Assumption 1 relates to selecting objectives; Assumption 2 relates to defining them. Basically, the latter states that one can generate high quality

definitions prior to development or evaluation activities. Here again, this is an expectation that is much of the time unrealistic and almost always unnecessary. Too often the disposition has been to sit down and in two or three hours define out the set of objectives to be worked for and evaluated. Once these are "laid down" they become dangerously fixed and resistent to change. It is important, therefore, not to overlook the refining and seasoning activity that can and should occur during development and evaluation. Often, an objective originally thought to be relevant will become less so or even irrelevant as materials are developed and instructional experiences planned. Or, an original objective, when evaluated, now appears overly difficult or overly easy. The imporant point here is that the actual process of planning for the development of a product or objective as well as developing its evaluation are effective catalysts in modifying and improving an objective. Therefore, a more mature posture would be to view predefined objectives as <u>prototypes</u> of those which will ultimately emerge . . . and even they will no doubt undergo further revision.

Assumption 3 is naive. Here we see in another form the unconscious tendency to finalize a given task. This disposition might simply be a reflection of the way a person views his reality. If he sees life in an absolute sense he might ask, "What is the correct or real definition of this objective? Once discovered, we can write it down for good." Expanding this disposition, a person might feel that people can and ought to be consistent and final in arriving at a set of objectives. Further, they should be able to decide that some objectives are absolutely more valuable than others; that there is a correct definition for any objective.

Now while this is an extreme position with which virtually no one would consciously identify, the prescriptive model is conducive to operating from a more absolute position. But functionally, a relative position is more viable and realistic. People are not generally consistent and final in selecting objectives. They do use one set of criteria for selection today and will use a different set tomorrow. Yesterday's objectives do seem trivial and lifeless today. Last week objective A appeared of little worth; this week it is considered top priority. Expanding somewhat, last year's curricular objectives seem outmoded and behind times in light of current world events. "Individualized learning" in the 1980's will be different from that of the 1970's. "Citizenship" among first graders is different from that among sixth graders.

To summarize the discussion surrounding assumption 3, we need to be much more relative and fluid in selecting, defining, and evaluating the worth of an objective or product. In doing so, we reduce the prescriptive power of the model as well as make it more loose and free wheeling . . . but the trade-off is a more realistic and responsive model.

Assumption 4 states that objectives ought to be defined as specifically as possible if they are to be maximally prescriptive. Traditionally, objectives have been defined specifically in order to make them more measurable. In addition, however, specific objectives are more prescriptive (refer to earlier discussion). This assumption is basically a sound one. The problem arises not in its veridicality but in what is being traded off. Specifically defined objectives are precise, measurable and prescriptive. But they are also limiting and often trivial. If objectives are too specific they become drill objectives. That is, if the student

can memorize the objective he can pass the evaluation. This makes the evaluation necessarily narrow. If, for example, we have the objective, "The student will be able to name the past presidents of the United States" then there is only one legitimate measurement item: "Would you name the past presidents of the United States." Another serious problem is that students become so focused by specific objectives they fail to engage in any searching behavior on their own, achieving only those that have been prespecified. Thus, the suggestion here is that objectives or products ought to be defined with some specificity but not too much. Such a practice will at once facilitate the teasing out of implications and yet reduce those undesirable trade-offs that have been mentioned.

We have already alluded to assumption 5, defined objectives which are mostly measurable are preferred to those which are mostly nonmeasurable. If two objectives are of equal worth, then the more measurable of the two would certainly be preferred. But not so if one is more worthwhile than the other. We ought not to select one defined objective over another simply because it is more measurable; the criterion for selection should be worth first and measurability second. If an important defined objective is mostly nonmeasurable, it should be used anyway. Any defined objective will have at least some suggestive power, and at least some implications for measurement.

Assumption 6 is more difficult to resolve. From a purely psychometric point of view, every attempt should be made to select or construct measuring instruments which measure the objectives as directly as possible. Stated more precisely, the measures should have high content validity. That is, the behaviors

and topics called forth by the measuring instruments should be as nearly as possible those identified in the objectives. The problem here is not so much that we end up with less valid measures, but that we end up measuring only those objectives upon which the instruments have been based. While the measures may indeed be valid, they are too often limiting. More will be said about his in the discussion of assumption 7.

There is a deeper psychometric problem surrounding assumption 6 which may not be resolved at the present time. Specifically defined objectives allow us to see clearly those behaviors and topics that must be measured and what types of instruments would be most appropriate. This builds high content validity in the sense of a one-to-one correspondence. But with specific objectives we end up with a very small number of items. Whenever we have very few measures of an objective these measures tend to have low content validity and reliability. Suppose for example the following objective: "The student will be able to correctly add 2 + 2." There is only one item that will obtain a strictly valid measure: 2+2= ____. We cannot present him with 3+2 or any other pair of single digit numbers. There is no domain of items from which we could draw a sample; our conclusion as to whether or not he can add 2+2 hinges on his response to but one question. While it might be argued that for this simplistic objective only one item is necessary, the problem becomes more real when we have a set of say, 10 less specific objectives each supposedly measured by only one item. Are we to conclude the student has achieved all 10 objectives if he can correctly answer one item about each?

But, suppose this less specific objective: "The student will be able to correctly add any two single digit numbers." Think of the domain of possible items than can now be developed: 2+2, 3+5, 9+1 and so forth. Since a large sample of items can be developed to measure this one objective, one can feel more comfortable about the validity and reliability of the measures; greater validity because the sampling is larger and greater reliability because there are more items. By way of conclusion, while we ought to strive to develop measures which tap the objectives as directly as possible, the objectives themselves ought to be stated generally enough so as to permit a variety of measures, thereby increasing validity and reliability.

Assumption 7 is probably one of the more dangerous of the assumptions: Measurement should be mostly limited to those objectives which have been defined in advance. The most serious consequence resulting from this assumption is that many evaluations end up undernourished. There are important incidental outcomes that deserve thoughtful evaluation in addition to those that are predefined. Indeed, these emerging and often subtle outcomes often turn out to be <u>more</u> important than the original objectives. They can be unforseen outcomes that emerge for the student, for materials, for the management system, for cost effectiveness, for implementation and so forth. In addition to outcomes, there are a great many other facets of a program than need to be examined. For example, the transactions between the teachers and students; the effectiveness of communication between administrators and teachers; the perceptions of different agencies involved; decisions that have been and will be made; effectiveness

of organizational climates. The point is that a thorough, deep-running evaluation must include measurements not only of predefined objectives but also of those that emerge during the product's development and/or evaluation.

Conclusions

A "prescriptive" model can be effectively used in planning a product's development and evaluation when we more realistically view the model as suggestive rather than prescriptive. Furthermore, by modifying some of the assumptions surrounding the use of the model, the model itself becomes more enriched and adaptable. Defined objectives can be useful in planning development and evaluation, but they need not be defined exclusively in advance . . . nor in too great detail . . . nor too measurably. The pendulum swings back.

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